acts to reduce estuarine salinity and may have restricted somewhat the hard clam habitat over this same time period. Third, rainfall variation influences salinity regimes. The drought period between 1985 and 1989 increased clam habitat. Clams were caught incidental to oyster dredging around the mouth of West Bay, which is not known as a clam-producing area.

Use of the hard clam resource has escalated greatly in North Carolina in recent decades, with an approximately 8-fold increase in landings from the 1960's and early 1970's to 1985. In the past two years, catch is down to the level of the late 1970's, but fishing effort is still high, suggesting continued high use of the hard clam habitat.

The habitat quality for hard clams in Pamlico Sound remains high, except to the degree that declining salinities because of inlet shoaling and stormwater runoff are restricting the extent of the habitat. The full extent of restriction or devaluation of hard clam habitat through reduced salinity has yet to be experienced because the last few years have been drought years. Clam Kicking and overfishing, however, are jeopardizing the sustained yield of hard clams in most habitats.

E. 2. d. Management/Regulatory Status and Trends. Hard clam habitat is protected in North Carolina by stormwater runoff regulations promulgated by the N.C. Environmental Management Commission and by management of bottom-disturbing practices by the N.C. Marine Fisheries Commission. Mechanical harvesting of hard clams is prohibited by N.C. Marine Fisheries Commission regulation in seagrass beds so as to protect the seagrasses from being uprooted. Unfortunately, some illegal harvest by the mechanical harvesters has occurred in seagrass beds, especially in southern Pamlico Sound just north of the Wainwright Islands. Inlet management is complicated by the need for federal cooperation to provide financial support for maintenance and dredging. Existing stormwater runoff regulations may not be protecting hard clam habitat, but no convincing evidence exists. A number of the major hard clam beds in the state are included in the areas that have been nominated for Outstanding Resource Waters designation.

E. 3. American Oyster Beds

E. 3. a. Description. Oysters (*Crassostrea virginica*) require a hard substrate for larval attachment and subsequent growth to adulthood. This hard substrate is ordinarily provided by biogenic calcium carbonate, namely the shells of dead or still living older oysters. Nevertheless, oyster habitat can include abiotic hard substrates, such as seawalls, bulkheads, and pilings (Ortega 1981). Oysters can tolerate lower salinities than hard clams or bay scallops, but they are limited to salinities of about 5-30 ppt (Chanley 1957; Galtsoff 1964; Burrell 1977). Intertidal oysters in North Carolina occasionally experience massive winter kills from intense freezes, but these events do not greatly restrict the oyster habitat in the Albemarle or Pamlico Sound, in part because there is virtually no tide and no intertidal zone in these bodies of water. Intense summer heat may contribute to oyster mortality by interacting with diseases to enhance mortality rates. This interaction between factors also does not limit oyster habitat in Pamlico or Albemarle sounds because summer maximum water temperatures are probably high enough everywhere in these water bodies to induce some stress. Summer anoxia in the deeper basins of the Albemarle and Pamlico sounds also greatly limits oyster habitat (Tenore 1972).

Oysters feed largely on suspended phytoplankton and suspended benthic microalgae (Haines and Montague 1979). These types of food sources for suspension-feeding invertebrates do not appear to be limited in North Carolina estuaries (Peterson and Beal 1989). The presence of hard